



Non-Provisional Application for United States Letters Patent  
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James R. Stuart

# **Method for Utilizing Excess Communications Capacity**

## **INTRODUCTION.**

The title of this Patent Application is *Method for Utilizing Excess Communications Capacity*. The Applicants, Thomas Nello Giaccherini, Post Office Box 1146, Carmel Valley, California 93924-1146, and Dr. James Riley Stuart, 1082 West Alder Street, Louisville, Colorado 80027-1046, are both citizens of the United States of America.

## **FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT**

None.

## **CROSS-REFERENCE TO A RELATED PENDING PATENT APPLICATION & CLAIMS FOR PRIORITY**

The Present Patent Application is a Continuation Application. The Applicants hereby claim the benefit of priority under 35 USC Sections 119 and/or 120 for any subject matter which is contained in both the Present Application and in Pending Parent Application Serial No. 09/579,324, filed on 25 May 2000.

## **FIELD OF THE INVENTION**

The present invention pertains to methods and apparatus for taking advantage of inefficiencies and excess capacities which are inherent in virtually all communications networks. More particularly, one preferred embodiment of the invention employs satellite networks to securely deliver copyrighted entertainment programming directly to homes.

## **BACKGROUND OF THE INVENTION**

In the past decade, many new satellite networks have been proposed. A few early systems, like Iridium<sup>SM</sup> and Globalstar<sup>SM</sup> have been launched, and currently provide some forms of worldwide telecommunications services. These satellites operate in low Earth orbits, and relay packets of digitized data from ground stations to customers using fixed, mobile or handheld terminals. Another satellite service called Directv<sup>SM</sup> operates in geosynchronous orbit, and furnishes a continuous stream of scheduled, analog signals that carry television programs and old motion pictures to residential customers. As of April, 2000, Directv<sup>SM</sup> had over eight million subscribers.

None of systems provides a highly interactive, high resolution entertainment digital system that supplies first-run movies on demand and protects against copyright infringement. The development of such a system would constitute a major technological advance, and would satisfy long felt needs and aspirations in the both the entertainment and telecommunications industries.

## SUMMARY OF THE INVENTION

The present invention provides methods and apparatus for delivering data over a network at times when the network experiences less than full transmission capacity.

5 In a preferred embodiment, a constellation of satellites in low Earth orbit receive packets of data from ground stations during these times of less than peak capacity. These packets are then conveyed to receivers over a relatively long period of time, where they are resequenced, and are then slowly accumulated on a storage device such as an array of hard drives. After this "accumulation period" is completed and  
10 a full supply of data has been built up, subscribers then retrieve the data from the storage device.

The invention provides a highly secure distribution system which thwarts copyright infringement and other unauthorized copying. The packets of data which are transmitted from the ground stations to the satellites, and then to the subscribers,  
15 are heavily encrypted. This data is always confined to the secure network, and is never introduced to the Internet or other public networks. The data conveyed by the present invention may be video or audio programming, business data, or any other type of information. Upon arrival at the subscriber's premises, the received signals are decrypted, but are not capable of being copied, since the receiver does not include  
20 any external disc or tapes drives or output ports. The subscriber's antenna, which captures the encrypted signals, is hard-wired to the receiver. The video display which

is viewed by the subscriber is also hard-wired to the receiver. The entire system is shielded to mitigate any local radio frequency emissions. The system is also tamper-proofed, so that any attempt to make unauthorized copies of data or to open the receiver cause an immediate erasure of all the data stored in the receiver.

- 5           An appreciation of the other aims and objectives of the present invention and a more complete and comprehensive understanding of this invention may be obtained by studying the following description of a preferred embodiment, and by referring to the accompanying drawings.

### **A BRIEF DESCRIPTION OF THE DRAWINGS**

Figures 1 and 2 are illustrations which show the transfer of data from a terrestrial gateway to a low Earth orbit satellite, and then to residential and other subscribers.

5 Figure 3 is a schematic depiction of the programming that is provided using a hard-wired apparatus comprising a roof-top antenna, a set-top box and a wide-screen, flat-panel display.

**A DETAILED DESCRIPTION OF PREFERRED  
& ALTERNATIVE EMBODIMENTS**

5 The present invention comprises methods and apparatus for delivering high  
quality digital signals to residential subscribers using the unused, excess capacity that  
is inherent in virtually all communication networks. In one preferred embodiment of  
the invention, satellites in low Earth orbit are employed to relay signals from a  
terrestrial gateway to subscribers in short bursts during the time that a satellite  
experiences underused capacity. Figure 1 illustrates this particular embodiment of the  
10 present invention. A satellite SAT in Earth orbit is capable of communicating with  
a ground station G. The ground station is connected to a terrestrial network, such as  
a public switched telephone network. When a satellite experiences a period of time  
when all its capacity is not utilized, the satellite can request an upload of data from  
the ground station. The ground station then sends packets of data to the satellite in  
15 short bursts. The satellite is capable of delivering packets of data to many different  
types of terminals, including residences R, office bulidings OB, cars and other  
vehicles C, aircraft A and boats B. The invention may be utilized to transmit signals  
to a wide variety of terminals, including cellular phones, personal digital assistants,  
portable computers and displays, or other intelligent appliances.

In this embodiment, digitized, heavily-encrypted packets are beamed up to the satellite from a ground station that stores an electronic, digital copy of a copyrighted first-run motion picture. In one embodiment, the transfer of packets is accomplished using asynchronous transfer methods, and the packets are then routed to, and  
5 resequenced in order at their final destination. As shown in Figures 2 and 3, the encrypted packets are received by an active beam steering antenna ANT at the subscriber's premises R, and are stored in a set-top box STB which includes a large dual-partitioned array of computer hard drives. The set-top box is hard-wired to a wide screen display WSD. Packets may be received by the set-top box in very small  
10 increments over long periods of time. These incoming packets are stored in one of the two partitions in the set-top box. The second partition is used to supply on-demand unlimited-view programming while the first partition is filled incrementally. In one embodiment of the invention, programming is routed to the first partition over a one week period while the second partition is used for viewing. At the end of the  
15 one week period, the functions of the partitions are exchanged. The "old" programming on second partition the is replaced with the next weeks' fare, while the current programming is viewed using the first partition. This "rain-barrel" method of incrementally transporting data to a large storage device enables the utilization of the under-used capacity of a satellite network. The novel use of this method of  
20 distribution to a storage device which is securely integrated with an interactive viewing apparatus provides secure distribution and viewing of copyrighted data. In one embodiment of the invention, the bulk of the download of programming from the satellite to the set-top box occurs during bursts that take place at night, when normal system traffic dwindles to levels far below peak day-time usage.

In an embodiment which utilizes wireless networks, a roof-top receiver is installed at the subscriber's premises to capture signals broadcast from the satellites or other wireless source. In one embodiment of the invention, the receiver is coupled to a phased-array antenna which uses active beam steering to track the satellites as they move across the sky. Another embodiment of the invention incorporates a passive, omni-directional antenna. The antenna is hard-wired to a set-top box which functions as both a receiver, decryption device and storage system. The set-top box contains an array of computer hard drives configured in two partitions for storing data. In an early embodiment of the invention, the hard drive array will have a capacity of about 100 to 200 Gb. The set-top box, in turn, is hard-wired to a large, high-resolution flat screen that is configured in a motion picture aspect ratio. The flat screen may incorporate home-theater quality speakers. The set-top box has no external ports, jacks, floppy-disc, tape or CD drives. All the cables between the antenna, the set-top box, wide screen display and speakers are hard-wired, heavily shielded and tamper-proofed to thwart copying or piracy of the programs. The receiver is "booby-trapped," so that any attempt to open the box by removing screws or by cutting a hole to attempt to make unauthorized copies triggers the immediate erasure of all data from the hard drives, incapacitates the set-top box and reports the tampering to the program provider over an Internet connection.

Unlike present entertainment services like Directv<sup>SM</sup>, Home Box Office<sup>SM</sup>, Showtime<sup>SM</sup>, The Movie Channel<sup>SM</sup>, Cinemax<sup>SM</sup> or Starz<sup>SM</sup>, one embodiment of the present invention provides immediate, on-demand programming which may be viewed an unlimited number of times at the subscriber's convenience for a monthly



fee. In a preferred embodiment of the invention, the programming package includes first-run theatrical releases, which has previously been shunned by the established motion picture industry due to copyright security and piracy issues. The monthly programming may also include interactive games, sports, news, educational content,  
5 classic films and both current and vintage television selections.

While the preferred embodiment of the invention is specifically configured for providing revolutionary entertainment programming, the invention may be utilized to transport any kind of data during the non-peak hours or under-utilized periods of operation of a satellite network. While the preferred embodiment is described as a  
10 particular use of low Earth orbit satellite constellations, any combination of LEO, MEO, GEO or other satellites, sub-orbital platforms or any other vehicle may be employed to implement the invention. The invention is not limited to using the excess capacity of satellite systems. Due to the novel incorporation of the "rain-barrel" feature for accumulating data slowly, over a long period of time and in small  
15 increments, any network of conventional copper land-lines, fibers, broadcast or microwave towers, cellular, PCS or any other network may benefit from a combination with the present invention. The invention may be practiced using the Internet and TCP/IP or TCP/UDP, over public switched telephone networks or over a private data network.

## CONCLUSION

Although the present invention has been described in detail with reference to one or more preferred embodiments, persons possessing ordinary skill in the art to which this invention pertains will appreciate that various modifications and enhancements may be made without departing from the spirit and scope of the Claims that follow. The various alternatives for providing a highly secure data distribution system that have been disclosed above are intended to educate the reader about preferred embodiments of the invention, and are not intended to constrain the limits of the invention or the scope of Claims. The List of Reference Characters which follow is intended to provide the reader with a convenient means of identifying elements of the invention in the Specification and Drawings. This list is not intended to delineate or narrow the scope of the Claims.

**LIST OF REFERENCE CHARACTERS**

A     Aircraft  
ANT   Antenna  
B     Boat  
C     Car  
G     Ground station  
OB    Office building  
R     Residence  
SAT   Satellite  
STB   Set-top box  
WSD   Wide screen display